

Response to the Office Action Dated July 19, 2004
Serial No. 10/612,458

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AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS

1. (Withdrawn) A commercial ice making method for producing commercial ice in convenient sizes for at least one of mobile food carts, market produce, or fish displays comprising the steps of:

introducing water into hollow walls of an elongated mold in an ice forming freezing tray oriented substantially horizontal said hollow walls comprising an inner, circular wall into which said water is introduced and an outer, circular wall spaced from said inner wall forming an arcuate shaped passageway extending the length of said mold, said mold having dividers in said inner wall forming separate ice forming compartments;

passing refrigerant through said arcuate shaped passageway to supercool water in said compartments forming ice segments to a temperature below 0 degrees F;

rapidly subjecting said supercooled ice segments to a short, temporary contact with a high heat source by momentarily passing a heated fluid through said passageway to melt a thin layer of ice adjacent said inner wall;

bypassing said refrigerant in a by pass pipe and exposing said refrigerant to said heated fluid in an adjacent portion of said passageway,

rotating said tray containing said ice segments to a substantially vertically oriented dump position whereby said ice segments are dumped from said mold into a collection bin.

2. (Withdrawn) The method as in Claim 1 wherein said arcuate passageway is crescent-shaped.

3. (Withdrawn) The method as in Claim 1 wherein said arcuate shaped passageway comprises a pair of arcuate, spaced apart parallel walls connected by connecting walls therebetween.

**Response to the Office Action Dated July 19, 2004
Serial No. 10/612,458**

4. (Withdrawn) The commercial ice making method as in Claim 1 in which exposure to said high heat source is carried out by reversibly cycling said refrigerant thereby creating said thin layer of water lubricating and dislodging said ice segments while said tray is in a vertical dumping position, said thin liquid interface layer quickly refreezing upon said dumped ice cube segments being dumped into said collection bin due to the supercooled temperature of said ice segments.

5. (Withdrawn) The commercial ice making method as in Claim 1 wherein said tray is tipped slightly during filling of said mold with water whereby excess water after said mold compartments are filled flows over a lower end of said mold into a trough, said tray being righted into a horizontal position after said compartments are filled with water for freezing, all of the water for said mold coming from a dispenser located adjacent a higher end of said mold.

6. (Withdrawn) The commercial ice making method as in Claim 1 wherein rotating of said freezing tray is facilitated by the use of loops of flexible refrigerant hoses.

7. (Withdrawn) The commercial ice making method as in Claim 6 wherein in a freeze cycle said liquid refrigerant flows through an expansion valve into said passageway, whereupon said refrigerant evaporates by extracting heat from said water thereby freezing said water into said ice segments, whereby further said refrigerant flows to a heat exchanger acting as a condenser with said liquid refrigerant flowing therethrough.

8. (Withdrawn) The commercial ice making method as in Claim 7 wherein said liquid refrigerant flows through said expansion valve into said heat exchanger acting as an evaporator extracting heat from ambient air to vaporize said liquid refrigerant, wherein suction is applied to said vaporized refrigerant from said heat exchanger to a compressor and onward to said passageway, which said freezing tray is subject to said temporary high heat source through said passageway and said freezing tray acts as a condenser giving up heat to temporarily melt bottom

**Response to the Office Action Dated July 19, 2004
Serial No. 10/612,458**

surfaces of said ice segments.

9. (Withdrawn) The commercial ice making method as in Claim 8 wherein use of said crescent shaped passageway in intimate contact with said freezing tray promotes rapid heat transfer, causing short ice batch formation cycles thereby providing high throughput of said ice segments.

10. (Withdrawn) A commercial ice making apparatus for producing commercial ice in convenient sizes for at least one of mobile food carts, market produce, or fish displays comprising:

 a substantially horizontal freezing tray comprising rows of elongated molds;

 each mold comprising an upper curved wall extending the length of said mold forming an upwardly facing concave surface divided into compartments by a plurality of spaced separators and a lower curved wall forming a crescent shaped passageway through the length of said mold, said upper and lower curved walls being joined at edges thereof;

 an inlet introducing water into said molds;

 means for introducing vapor compression refrigerant into one end of each passageway for making intimate contact with said compartments to produce a plurality of ice segments in said compartments;

 said refrigerant adapted to supercool said ice segments to a temperature below 0 degrees F.

11. (Withdrawn) The method as in Claim 10 wherein said arcuate passageway is crescent-shaped.

12. (Withdrawn) The method as in Claim 10 wherein said arcuate shaped passageway comprises a pair of arcuate, spaced apart parallel walls connected by connecting walls therebetween.

**Response to the Office Action Dated July 19, 2004
Serial No. 10/612,458**

13. (Withdrawn) The commercial ice making apparatus as in Claim 10 further comprising a timer rapidly subjecting said supercooled ice segments to a short, temporary contact with a high heat source in said passageway.

14. (Withdrawn) The commercial ice making apparatus as in Claim 11 further comprising a rotator for rotating said freezing tray containing said at least one batch of ice segments about said horizontally oriented, longitudinally extending axis, to a vertically oriented dump position for dumping said temporarily heated ice segments from said freezing tray into a collection bin.

15. (Withdrawn) The commercial ice making apparatus as in Claim 14 further comprising a reversible cycle heat pump alternately cycling said refrigerant and said high heat source into said passageway for a brief thaw cycle, thereby creating a thin layer of water at an interface between said ice segments and a surface of said freezing tray, thereby lubricating and dislodging said ice segments while said tray is in a vertical dumping position, said thin liquid layer quickly refreezing upon said dumped ice cube segments being dumped due to the supercooled temperature of said ice segments.

16. (Withdrawn) The commercial ice making apparatus as in Claim 10 wherein said water inlet source is removable away from said horizontal freezing tray, exposing said freezing tray for display of objects thereon.

17. (Withdrawn) The commercial ice making apparatus as in Claim 16 further comprising said compartments of said freezing tray being shallow with an increased a radius of arc of said compartments and a decreased a vertical height thereof.

18. (Withdrawn) The commercial ice making apparatus as in Claim 13 wherein in a freeze cycle said refrigerant is a liquid which flows through an expansion valve into said freezing tray, whereupon said refrigerant evaporates by extracting heat from said water thereby freezing

**Response to the Office Action Dated July 19, 2004
Serial No. 10/612,458**

said water into said ice segments, whereby further said refrigerant flows to a heat exchanger acting as a condenser with said liquid refrigerant flowing therethrough.

19. (Withdrawn) The commercial ice making method as in Claim 18 wherein said liquid refrigerant flows through an expansion valve into said heat exchanger acting as an evaporator extracting heat from ambient air to vaporize said liquid refrigerant, wherein suction is applied to said vaporized refrigerant from said heat exchanger to a compressor and onward to said passageway, which said freezing tray is subject to said temporary high heat source through said passageway and said freezing tray acts as a condenser giving up heat to temporarily melt said bottom surfaces of said ice segments.

20. (Withdrawn) The commercial ice-making machine as in Claim 18 wherein at least one non-metallic spacer with sub-compartments is inserted into said compartments prior to entry of water thereto.

21. (Withdrawn) The commercial ice making machine of claim 10 having means to slightly tilt said freezing tray during filling of said compartments with water, a trough being positioned to collect surplus water after said compartments are filled with water, said tilt means rotating said freezing tray to a horizontal position for freezing of water in said compartments after said compartments are filled with water.

22. (Currently amended) The method of producing salt-containing segments of ice in which the salt is substantially uniformly distributed throughout the ice segments comprising the steps of:

pouring water containing salt into a horizontal mold divided into separate ice forming compartments;

chilling said mold while in a horizontal position with a uniform application of coolant to an underside and sides of said mold at a sufficient rate of cooling to prevent desalination of the water in said mold and produce a single solid segment of salt-

Response to the Office Action Dated July 19, 2004
Serial No. 10/612,458

containing ice in and conforming in shape to each compartment; [[and]]
continuing said chilling until the temperature of the salt-containing ice in said mold
is between minus 10° F and minus 50° F thereby producing supercooled segments of salt-
containing ice in and conforming in shape to each of said compartments[[.]] ; and
removing said segments conforming in shape to said compartments from said
mold.

23. (Previously presented) The method of claim 22 in which said segments of salt-
containing ice are removed by rapidly subjecting said supercooled salt-containing ice segments to
a short, temporary contact with a high heat source to melt a thin layer of salt-containing ice
adjacent walls of said mold and rotating said mold to a substantially vertically oriented dump
position whereby said segments of salt-containing ice are dumped from said mold into a
collection bin.

24. (Original) The method of claim 22 in which said water containing salt is seawater.

25. (Original) The method of claim 22 in which said water contains salt in the amount of
about 3% by weight of salt content.

26. (Original) The method of claim 22 in which chilling is at the rate of about twenty to
thirty minutes time duration.

27. (Original) The method of claim 22 in which wherein said mold is tipped slightly
during filling to discharge excess water into a trough, said mold being righted back into a
horizontal position after said compartments are filled with salt water for freezing.

28. (Currently amended) The method of claim 22 in which said mold comprises an upper
curved wall extending the length of said mold forming [[an]] a first upwardly facing concave
surface divided into and forming said compartments by a plurality of spaced separators and a

Response to the Office Action Dated July 19, 2004
Serial No. 10/612,458

lower curved wall having a second upwardly facing concave surface facing said upper curved wall forming an arcuate shaped passageway through the length of said mold, said upper and lower curved walls being joined at edges thereof.

29. (Original) Supercooled segments of ice containing salt produced by the method of claim 22.

30. (Currently amended) Supercooled segments of ice containing salt made by the process of:

pouring water containing salt into a horizontal mold divided into separate ice forming compartments;

chilling said mold while in a horizontal position by the uniform application of coolant to an underside and sides of the mold at a sufficient rate of cooling to prevent desalination of the water in said mold and produce a single solid segment of salt-containing ice in each compartment, wherein each said single solid segment of salt containing ice conforms in shape to a compartment; and

continuing said chilling until the temperature of the salt-containing ice in said mold is between minus 10° F and minus 50° F to produce thereby producing supercooled segments of ice conforming in shape to said compartments.

31. (Original) The supercooled segments of ice of claim 30 in which the salt content of said segments is about 2.7% by weight.

32. (Original) The supercooled segments of ice of claim 30 in which the salt content of said segments is in the range of about 2% to 4% by weight.

33. (Original) The supercooled segments of ice of claim 30 in which said water is sea water.

Response to the Office Action Dated July 19, 2004
Serial No. 10/612,458

34. (Currently amended) [[The]] A method of producing beverage containing segments of ice in which non-water components are substantially uniformly distributed throughout the ice segments comprising the steps of:

pouring water containing beverage components into a horizontal mold divided into separate ice forming compartments;

chilling said mold while in a horizontal position by the uniform application of coolant to an underside and sides of the mold at a sufficient rate of cooling to prevent separation of the water in said mold and produce a single solid segment of frozen beverage in each compartment; and

continuing said chilling until the temperature of the segment of frozen beverage in said mold is between minus 10° F and minus 50° F thereby producing supercooled segments of frozen beverage.

35. (Previously presented) The method of claim 34 in which said segments of frozen beverage are removed by rapidly subjecting said supercooled segments of beverage to a short, temporary contact with a high heat source to melt a thin layer of frozen beverage adjacent walls of said mold and rotating said mold to a substantially vertically oriented dump position whereby said segments of frozen beverage are dumped from said mold into a collection bin.

36. (Original) The method of claim 34 in which said water containing beverage is a carbonated beverage.

37. (Original) The method of claim 34 in which said water containing beverage is an alcoholic beverage.

38. (Original) The method of claim 34 in which said water containing beverage is a beer beverage.

39. (Original) The method of claim 34 in which said water containing beverage is a wine

**Response to the Office Action Dated July 19, 2004
Serial No. 10/612,458**

beverage.

40. (Original) The method of claim 34 in which said water containing beverage is juice.

41. (Original) The method of claim 34 in which wherein said mold is tipped slightly during filling to discharge excess water into a trough, said mold being righted back into a horizontal position after said compartments are filled with beverage water for freezing.

42. (Currently amended) The method of claim 34 in which said mold comprises an upper curved wall extending the length of said mold forming a first [[an]] upwardly facing concave surface divided into said compartments by a plurality of spaced separators and a lower curved wall having a second upwardly facing concave surface facing said upper curved wall forming an arcuate shaped passageway through the length of said mold, said upper and lower curved walls being joined at edges thereof.

43. (Previously presented) Supercooled segments of frozen beverage produced by the method of claim 34.

44. (Currently amended) Supercooled segments of ice containing a beverage made by the process of:

pouring water containing a beverage into a horizontal mold divided into separate ice forming compartments;

chilling said mold while in a horizontal position by the uniform application of coolant to an underside and sides of the mold at a sufficient rate of cooling to prevent separation of the water and beverage components in said mold and produce a single solid segment of frozen beverage in each compartment; and

continuing said chilling until the temperature of the frozen beverage in said mold is between minus 10° F and minus 50° F thereby producing supercooled segments of frozen beverage.

**Response to the Office Action Dated July 19, 2004
Serial No. 10/612,458**

45. (Withdrawn) A commercial ice making method for producing commercial ice in convenient sizes for at least one of mobile food carts, market produce, or fish displays comprising the steps of:

introducing water into hollow walls of an elongated mold in an ice forming freezing tray oriented substantially horizontal said hollow walls comprising an inner, circular wall into which said water is introduced and an outer, circular wall spaced from said inner wall forming an arcuate shaped passageway extending the length of said mold, said mold having dividers in said inner wall forming separate ice forming compartments;

passing refrigerant through said arcuate shaped passageway to supercool water in said compartments forming ice segments to a temperature below 0 degrees F;

rapidly subjecting said supercooled ice segments to a short, temporary contact with a high heat source by momentarily passing a heated fluid through said passageway to melt a thin layer of ice adjacent said inner wall;

rotating said tray containing said ice segments to a substantially vertically oriented dump position whereby said ice segments are dumped from said mold into a collection bin;

wherein said arcuate shaped passageway comprises a pair of arcuate, spaced apart parallel walls connected by connecting walls therebetween.

46. (Withdrawn) The commercial ice making apparatus as in Claim 10 wherein said apparatus is deployed upon a boat and said water is seawater.

47. (New) The method of Claim 28 in which said arcuate shaped passageway is in the form of a crescent.

48. (New) The method of Claim 28 in which said lower curved wall is parallel to and spaced from said upper curved wall.

49. (New) The method of producing segments of freshwater ice comprising the steps of:

**Response to the Office Action Dated July 19, 2004
Serial No. 10/612,458**

pouring freshwater into a horizontal mold divided into separate ice forming compartments;
chilling said mold while in a horizontal position with a uniform application of coolant to
an underside and sides of said mold at a sufficient rate of cooling to produce a single solid
segment of freshwater ice in and conforming in shape to each compartment;
continuing said chilling until the temperature of the freshwater ice in said mold is between
minus 10° F and minus 50° F thereby producing supercooled segments of freshwater ice in and
conforming in shape to each of said compartments; and
removing said segments conforming in shape to said compartments from said mold.

50. (New) The method of claim 49 in which said segments of freshwater ice are removed
by rapidly subjecting said supercooled freshwater ice segments to a short, temporary contact with
a high heat source to melt a thin layer of freshwater ice adjacent walls of said mold and rotating
said mold to a substantially vertically oriented dump position whereby said segments of
freshwater ice are dumped from said mold into a collection bin.

51. (New) The method of claim 49 in which chilling is at the rate of about twenty to thirty
minutes time duration.

52. (New) The method of claim 49 in which wherein said mold is tipped slightly during
filling to discharge excess water into a trough, said mold being righted back into a horizontal
position after said compartments are filled with freshwater for freezing.

53. (New) The method of claim 49 in which said mold comprises an upper curved wall
extending the length of said mold forming a first upwardly facing concave surface divided into
and forming said compartments by a plurality of spaced separators and a lower curved wall
having a second upwardly facing concave surface facing said upper curved wall forming an
arcuate shaped passageway through the length of said mold, said upper and lower curved walls
being joined at edges thereof.

**Response to the Office Action Dated July 19, 2004
Serial No. 10/612,458**

54. (New) Supercooled segments of freshwater ice produced by the method of claim 49.

55. (New) Supercooled segments of freshwater ice made by the process of:
pouring freshwater into a horizontal mold divided into separate ice forming compartments;

chilling said mold while in a horizontal position by the uniform application of coolant to an underside and sides of the mold at a sufficient rate of cooling to produce a single solid segment of freshwater ice in each compartment, wherein each said single solid segment of freshwater ice conforms in shape to a compartment; and

continuing said chilling until the temperature of the freshwater ice in said mold is between minus 10° F and minus 50° F to produce supercooled segments of freshwater ice conforming in shape to said compartments.

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